PATENT SPECIFICATION (11) 1214818

1214818

DRAWINGS ATTACHED

(21) Application No. 57224/67 (22) Filed 15 Dec. 1967

(31) Convention Application No. 6561 (32) Filed 19 Dec. 1966 in

(33) Denmark (DK)

(45) Complete Specification published 2 Dec. 1970

(51) International Classification B 01 f 5/04, 7/20

(52) Index at acceptance B1C 1 19F4E 4 5 9 B2E

(54) IMPROVEMENTS IN AND RELATING TO APPARATUSES FOR INTRODUCING ONE FLUID INTO ANOTHER

(71) I, HANS ANDREAS LARSEN, of No. 1 Rødovrevej, Copenhagen-Rødovre, Denmark, a citizen of Denmark, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to an apparatus for introducing one fluid into another comprising a driven shaft on which a number of vanes are disposed.

The said fluids may be constituted of two liquids, two gases, or of one liquid and one gas. Apparatuses of the type here referred to may e.g. be used for introducing atmospheric air or possibly pure oxygen into water, but many other mixtures and solutions may also be produced by means of the apparatus.

An apparatus is known for aerating water, the said apparatus comprising a pump housing in which a pump rotor comprising a great number of vanes or blades is mounted. The rotor and thereby also the pump housing are divided into two parts by means of a partition disposed at right angles to the axis of rotation of the rotor in the symmetry plane of the rotor. The apparatus is provided with two inlets, viz. an axial inlet on either side of the said partition, and a number of outlets distributed along the circumference of the housing. The known apparatus is intended for being placed in an artificial pool or pond, one inlet being in communication with the water, while the other inlet is in communication with a tube carried up over the water surface. The apparatus is intended for functioning in the way that, when the pump rotor is started rotating, water is drawn in through one inlet and air through the other, whereupon the said two fluids are mixed in the pump housing and in the outlets. A drawback of the known apparatus is, that in practice it is impossible to adjust the rate of revolution for the rotor in such a way that an effective pumping of the water as well as of the air is achieved. If the speed of rotation is set at a value suited for water, the part of the apparatus intended for pumping air will work at far too low a speed. If, on the other hand, the speed of rotation is set so that an effective pumping of the air is obtained, the speed of rotation will be far too high for attaining an optimum pumping of water. To this must be added, that the presence of air in the pump housing will to some degree reduce the capacity of the apparatus to pump water and thereby the efficiency of the apparatus.

The object of the present invention is to provide an apparatus which does not suffer from the said drawbacks of the known apparatus.

According to the invention there is provided an apparatus for introducing a first fluid having a first density into a second fluid having another and higher density, comprising a hollow, driven shaft, the inside of which communicates with the first fluid and of which a part is in the second fluid, which part has one or more vanes having a V-shaped cross section and holes leading to the inside of the shaft between the branches of the V-shape of the vanes, that the part of the hollow shaft which carries the vanes being inside an oblique or vertical pipe.

According to the invention, a pump impeller may be mounted on the shaft. In this case the first fluid may possess a considerable axial velocity when passing the vanes.

The invention will in the following be further explained with reference to the diagrammatical drawing in which

Fig. 1 shows an apparatus according to the invention, partially in section,

Fig. 2 a section on line II—II of Fig. 1,

Fig. 3 a section on line III—III of Fig. 1,

[*Price 5s. 0d. (25p)*]

Fig. 4 a section on line IV—IV of Fig. 3,

Fig. 5 another embodiment of the vanes in an illustration corresponding to that shown in Fig. 3, and

Fig. 6 part of the construction shown in Fig. 5 viewed in the direction of the arrow VI in Fig. 5.

The apparatus shown in Figs. 1—4 comprises a hollow shaft 1 which by means of a extension-piece 2 and a bushing 3 is carried watertight and revolving through the wall of a tube 4. At its top the shaft 1 is driven by means, not shown, so that viewed from above in Fig. 1 it rotates clockwise. At its lower end the shaft 1 is extended with a solid shaft 5 on which a pump rotor with obliquely disposed vanes 6 is mounted.

In the lower end of the tube 4 a short pipe length 7 is secured which carries a set of guide vanes 8 together with a bearing for the shaft 5.

When the shaft 1, 5 rotates, as indicated above, and the lower end of the tube 4 is in a fluid, e.g. water, the said fluid will be pumped up through the tube.

On the part of the hollow shaft 1 located in the tube and thereby in the said fluid a number of vanes 9 are disposed, the construction of which appears clearly from Figs. 3 and 4. As will be seen, each vane consists of sheet material bent into V-shape, and when the shaft rotates as indicated above, the apex of the V will be foremost in the direction of movement, so that a partial vacuum will occur between the limbs of the V. At the points where the vanes 9 are secured to the shaft 1, holes 10 are provided between the limbs of the V in the wall of the shaft, so that the partial vacuum will spread to the interior of the hollow shaft.

Outside the tube 4, the interior of the hollow shaft 1 is put in communication with another fluid, e.g. atmospheric air, by means of holes 11 which in the embodiment shown are disposed pairwise above each other. Behind each pair of holes, taken in the direction of movement, a scoop 12 is placed, and it will be seen that when the shaft rotates in the direction indicated above there will within each scoop be produced an elevated pressure which will tend to force the said fluid, e.g. air, in through the holes 11 to the interior of the shaft. The scoops 12 are not necessary for attaining the effect that is the object of the present invention, but they cause an increase of the effect produced by means of the vanes 9, the said effect consisting in that the fluid, in which the holes 11 are located, is through the holes 10 sucked out into the fluid flowing through the tube 4.

As appears from Fig. 4, the symmetry planes of the vanes 9 are oblique in relation to a plane at right angles to the shaft 1, 5. This entails that the vanes 9 can exert a certain pumping action in the direction of the shaft 1, 5. If the pump rotor 6 was not present, the vanes 9 might therefore by themselves cause a pumping of the fluid present in the tube 4, provided that the back-pressure was not too high. The pumping effect can be increased if the vanes 9 are combined with stationary guide vanes corresponding to the vanes 8 shown in Fig. 1. Also in the case where the vanes are combined with a pump proper, as shown in Fig. 1, the obliquity of the symmetry planes of the vanes may be advantageous, as a given obliquity, dependent on the axial velocity of the fluid flowing through the tube 4, will offer the least possible resistance to the movement of the vanes in the said fluid.

Figs. 5 and 6 show another form of the vanes, which are here designated by 13. In this case the front edges of the vanes, taken in the direction of movement, are curved slightly backwards, and this will cause that objects, if any, in the fluid flowing in the tube 4 that are caught by the vanes 13 will easily slide off again. Also in this case the symmetry planes of the vanes may be oblique so that a pumping effect in the direction of the shaft is achieved.

The apparatus described above is particularly well suited for introducing a gas, e.g. atmospheric air, into a liquid, e.g. water. By suitable dimensioning the apparatus according to the invention may, however, also be used for introducing one liquid into another liquid or one gas into another gas.

As by means of the vanes 9 or 13 and the scoops 12, if any, a pressure difference is produced, the fluid flowing into the hollow shaft may furthermore be brought to perform work, so that a transmission of forces may be involved.

The vanes need not have the shapes shown in the drawing. They should only be so shaped that a partial vacuum is produced behind the vanes.

The number of the vanes may be chosen at will.

WHAT I CLAIM IS:—

1. An apparatus for introducing a first fluid having a first density into a second fluid having another and higher density, comprising a hollow, driven shaft, the inside of which communicates with the first fluid and of which a part is in the second fluid, which part has one or more vanes having a V-shaped cross section and holes leading to the inside of the shaft between the branches of the V-shape of the vanes, that the part of the hollow shaft which carries the vanes being inside an oblique or vertical pipe.

2. An apparatus as claimed in claim 1, in which the symmetry planes of the vanes form angles different from 0° with a plane at right angles to the shaft.

3. An apparatus as claimed in claim 2, comprising one or more flow straighteners mounted inside the pipe in the proximity of the vanes.

4. An apparatus as claimed in claims 1, 2 or 3, in which an impeller is mounted on the shaft.

5. An apparatus substantially as described with reference to the accompanying drawing.

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1970.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1214818 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

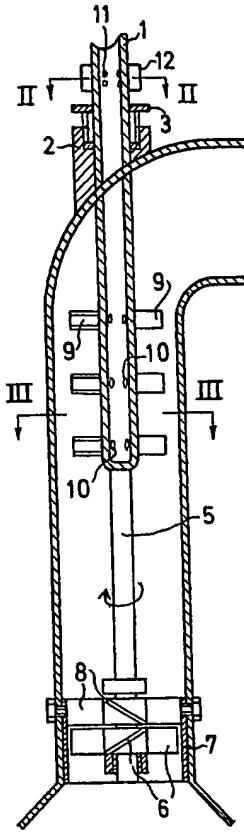

FIG.1

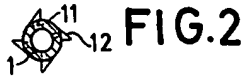

FIG.2

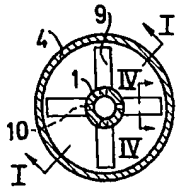

FIG.3

FIG.4

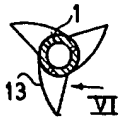

FIG.5

FIG.6